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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/600,546	07/12/2000	CLAUDE CHAPPERT	15675.P322	7116

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EXAMINER

ANGEBRANNDT, MARTIN J

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 03/26/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/600,546

Applicant(s)

CHAPPERT ET AL.

Examiner

Martin J Angebranndt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

1 The response provided by the applicant has been read and given careful consideration. Responses to the arguments of the applicant are presented after the first rejection to which they are directed. Basis for minimizing the surface roughness and optical reflectivity appear on pages 4 and 5 of the specification and support the language of claims 11,18 and 19. The language of claims 1 and 14 now is limited to patterns having at least one dimension of less than 1 micron in size. Lines are described at page 13/line 32-34 and individual spots oat page 13/lines 18-20. The applicant states that claim 14 provides for passage of the light ions through the top layer without significantly interacting with it. This is entirely incorrect interpretation of the claim. Claim 14 is silent concerning any particular interaction or lack thereof with the top layer, which is quire different from indicating that there is no interaction as set forth in claim 15. The structure of the claim is allowed as the applicant is allowed to draft the language of the claims. The examiner is noting that the applicant's incorrect interpretation would claim 15 superfluous and that the applicant's interpretation of the phenomena is not supported by the specification, and therefore constitutes new matter. The presence of new matter would open any patent issuing from this application open to legal challenge on that basis and therefore should be avoided.

2 The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3 Claims 12,13,15 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The language "capable of modifying chemical composition of only one of the layers", should read -- capable of modifying **the** chemical composition of only one of the layers-- (claim 12)

The language "wherein chemical composition of at least one of the layers remains unchanged after the irradiation" should read - - wherein **the** chemical composition of at least one of the layers remains unchanged after the irradiation - - (claim 13)

The language "wherein the irradiation is capable of modifying the buried layer of the multi-layer material without significantly interacting with atoms of the at least one top layer ..." should read - - wherein the irradiation is capable of modifying the buried layer of the multi-layer material without significantly interacting with **the** atoms of the at least one top layer ... - (claim 15)

In claim 18 at line 2 "effect an" should read - - affecting the- -

Claims 12 and 13 are substantially duplicates (see MPEP 2173.05(n), 37 CFR 1.75(b)).

4 The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5 Claims 12, 13 and 15-16 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The language "capable of modifying [**the**] chemical composition of only one of the layers", "wherein [**the**] chemical composition of at least one of the layers remains unchanged

after the irradiation", and "wherein the irradiation is capable of modifying the buried layer of the multi-layer material without significantly interacting with [the] atoms of the at least one top layer ..." lack support in the specification as originally filed. This language is similar to that added in the amendments of 6/17/2002 and 4/29/2002 is unsupported by the specification. The specification seems to be silent on the resultant compositions of the bulk phases of the layers. This language must be removed in the next amendment if the applicant cannot find support for this in the specification as originally filed. **The examiner notes that as this is a ballistic effect (impact phenomena, it may not be possible to effect only the interface without alloying the entire thickness of the topmost layer. Moving the language to dependent claims does not obviate the issue of new matter.**

With respect to claim 16, there is reference to 2.25 and approximately 5 and 4 atomic planes for the thickness of the intermediate cobalt layer appearing on page 10. There is no reference to this thickness of the top layer in the specification. **(this is new matter).**

6 The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8 Claim 1,11 and 14 are rejected under 35 U.S.C. 102(b) as being fully anticipated by or alternatively obvious over Steckl et al. "Review of Focused ion beam mixing for the fabrication of GaAs based optoelectronic devices", J. Vac. Sci. Technol. B, Vol 13(6) pp 2570-2575 (11/12-1995)

The use of a Si^{2+} (28.09 AU) focused ion beam (FIB) with an energy of 100 or 200 Kev and a dosage of 10^{14} ions/cm² to form the mixed region shown in figure 1 is disclosed in the left hand column of page 2571. The use of resists or masks with wider beams is disclosed in the introduction section. The irradiated areas are lines.

For the purposes of the claim the terms "on the order of or less than a hundred keV is held to embrace any value less than several hundred keV as "the order of" refers to the order of magnitude. The phrase on the order of 1 micrometer is treated similarly. The scope of the claim has been treated to embrace light ions of less than 100 AU based upon the disclosure on page 9 at line 15-16 defining "heavy ions" as those having a mass on the order of 100 [AU] and the direction to the use of Kr⁺ ions on page 9 at lines 27-32.

The examiner holds that the lines shown in figure 1 are 1 microns or less in width and anticipated the claimed invention or alternatively it would have been obvious to use lines of 1 micron or less based upon the disclosure to use this technique with ion beams of 100 nm or less on page 2570.

The examiner had stated that these rejection would be reinstated if the new matter was removed from the claims on page 4 of the previous office action. No arguments were presented by the applicant arguing the impropriety of these rejections, therefore no response can be made.

The examiner notes that intended use/functionality language indicating that irradiation/writing process is "adapted for" forming a particular article is not the same as saying that the process produces that article. Therefore this language is accorded proper weight only when considering that the process while adapted to make one article, may be used to produce another, thereby according it its proper breadth.

9 Claims 1, 3-5, 11, 14 and 16-19 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Jung et al. "Atomic Transport by Ion Beam Mixing in the Radiation Enhanced Diffusion Region", Mat. Res. Soc. Symp. Proc. Vol. 354 pp. 21-26 (1995)

The use of 80 keV Ar^+ (39.95 AU) **ion beam** to cause mixing in Pd/Co multilayers at dosages of $1.5 \times 10^{16} \text{ Ar}^+/\text{cm}^2$ is disclosed.

The examiner assumes that this beam is somewhat focused and therefore below 1 micron in diameter

10 Claim 1, 11 and 14 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Kanayama et al., "Fine Pattern Definition with Atomic Intermixing Induced by Focused Ion Beam and Its Application to X-ray Mask Fabrication", J. Vac Sci. Technol. B, Vol 9(2) pp. 296-301 (4/1991).

The use of focused ion beams of 300 keV Kr^+ (39.95 AU) at a dosage of $5 \times 10^{15} \text{ ion/cm}^2$ to mix aluminum and gold layers is disclosed in section B. Similar results are disclosed

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for a 50 keV Ga⁺ (69.72 AU) beam at dosages of $2-5.8 \times 10^{15}$ ion/cm² and 1.1×10^{16} ion/cm² in section A. The abstract states that patterns of 0.1 microns is size are defined.

11 Claims 1, 3-5, 11, 14 and 16-19 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Amaral et al., "Very Thin Fe/Ni modulation multilayer Films Under Ion Bombardment", J. Appl. Phys., Vol. 81(8) pp. 4773-4775 (04/1997).

The irradiation with multilayered Fe/Ni films with 14 keV He, 70 keV Ne and 400 keV Xe beams at dosages of 10^{16} to 10^{17} are disclosed as causing mixing. See figure 1, 3 and 4.

12 Claims 1, 2, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Steckl et al. "Review of Focused ion beam mixing for the fabrication of GaAs based optoelectronic devices", J. Vac. Sci. Technol. B, Vol 13(6) pp 2570-2575 (11/12-1995).

It would have been obvious to use resist or mask to pattern a wider ion beam in place of the focused ion beam in the process exemplified based upon their disclosed equivalence.

13 Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amaral et al., "Very Thin Fe/Ni modulation multilayer Films Under Ion Bombardment", J. Appl. Phys., Vol. 81(8) pp. 4773-4775 (04/1997), in view of Steckl et al. "Review of Focused ion beam mixing for the fabrication of GaAs based optoelectronic devices", J. Vac. Sci. Technol. B, Vol 13(6) pp 2570-2575 (11/12-1995)

It would have been obvious to use resist or mask to pattern a wide ion beam in place of any focused ion beam in the process exemplified by Amaral et al., "Very Thin Fe/Ni modulation multilayer Films Under Ion Bombardment", J. Appl. Phys., Vol. 81(8) pp. 4773-4775 (04/1997) based upon their disclosed equivalence within the art by Steckl et al. "Review of Focused ion

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beam mixing for the fabrication of GaAs based optoelectronic devices", J. Vac. Sci. Technol. B, Vol 13(6) pp 2570-2575 (11/12-1995).

14 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebranndt whose telephone number is 703-308-4397.

The examiner can normally be reached on Mondays-Thursday and alternative Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Martin J Angebranndt
Primary Examiner
Art Unit 1756

March 24, 2003